

Serial No. 10/035,257Attorney Docket No. 262/014

REMARKS

Claims 1-3 are currently pending in the subject application.

Applicants appreciate the Examiner's indication of the acceptance of the revised drawing figures submitted in response to a previous Office Action.

Claims 1-3 are presented to the Examiner for further prosecution on the merits.

A. Introduction

Claims 1-3 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,376,355 to Yoon et al. ("the Yoon et al. reference") in view of U.S. Patent No. 6,143,645 to Hsu et al. ("the Hsu et al. reference").

B. Asserted Rejections Under 35 U.S.C. § 103(a)

In the outstanding Office Action, the Examiner rejected claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over the Yoon et al. reference in view of the Hsu et al. reference.

This rejection is respectfully traversed, and it is respectfully submitted that combining the teachings of the cited prior art references as suggested by the Examiner in the outstanding Office Action does not yield the present invention as claimed.

In the outstanding Office Action, the Examiner correctly states that the Hsu et al. reference discloses forming a thin diffusion barrier layer 510 on a "barrier metal" (wetting layer 500) except in a recess region. The Hsu et al. reference discloses formation of the thin diffusion barrier layer 510 on the "barrier metal" (wetting layer 500) except in the recess region to prevent diffusion of the wetting agent of the "barrier metal" (wetting layer 500) from diffusing into a subsequently deposited metal 520 in the field region (away from a contact hole or via) of a substrate.

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In the outstanding Office Action, the Examiner further correctly states that the Yoon et al. reference teaches depositing a barrier metal 109 on an entire surface of a substrate having an insulating layer 105 with a recess formed thereon, and selectively depositing an anti-nucleation layer 113 on the barrier metal 109 except in the recess region.

However, the Examiner's assertion that the teachings of the Hsu et al. reference relative to the thin diffusion barrier layer 510 would suggest to one of ordinary skill in the art to form a metal or metal alloy on the anti-nucleation layer 113 except in the recess region of the Yoon et al. reference is respectfully traversed, as the Hsu et al. reference, with respect to the thin diffusion barrier layer 510, teaches only the deposition thereof on a "barrier metal" (wetting layer 500) except in the recess region, and neither reference discloses or suggests an anti-nucleation layer - much less a formation of a metal or metal alloy thereon.

The metal or metal alloy inhibiting aluminum migration as recited in claim 1 is required only when an anti-nucleation layer is present. A problem that occurs in a conventional preferential metal deposition (PMD) process is the movement, or migration, of reflowed PVD aluminum onto an anti-nucleation layer. The problem is not one of aluminum diffusion, as suggested in the outstanding Office Action. The movement or migration of reflowed PVD aluminum onto an anti-nucleation layer is very active because PVD aluminum does not react with an anti-nucleation layer. Uncontrolled grain growth and subsequent fabrication defects, such as the ring defect described in the specification at paragraphs [0031] – [0033], may occur as a result of the mobility of the reflowed PVD aluminum onto the anti-nucleation layer. The method of the present invention as recited in claim 1 includes depositing a metal or metal alloy on the anti-nucleation layer to prevent such a migration of aluminum onto the anti-nucleation layer. Unlike the present invention as claimed, the Hsu et al. reference does not disclose

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depositing a metal or metal alloy on an anti-nucleation layer because there is no anti-nucleation layer in the device or method of the Hsu et al. reference.

The Yoon et al. reference is directed to a PMD process using an anti-nucleation layer. However, the Yoon et al. reference does not disclose nor does it suggest depositing a metal or metal alloy thereon for inhibiting aluminum migration as recited in claim 1. Therefore, the aforementioned fabrication defects avoided by the present invention as claimed may be generated and present in the device of the Yoon et al. reference.

Further, it is respectfully submitted that combining the teaching of the Hsu et al. reference, i.e., forming a thin diffusion barrier layer 510 on a barrier metal 500 except in a recess region, with the teachings of the Yoon et al. reference, i.e., a device which includes a barrier metal 190 formed on an insulating layer having a recess region, as suggested by the Examiner in the outstanding Office Action, would yield a device or method in which a thin diffusion barrier layer (i.e., 510) is formed on the barrier metal 190 except in the recess region of the Yoon et al. reference. Forming a thin diffusion barrier layer on a barrier metal except in a recess region is not analogous and bears no relationship to depositing a metal or metal alloy on an anti-nucleation layer except in a recess region of a semiconductor device, as disclosed and claimed in the subject application.

Therefore, it is respectfully submitted that combining the teachings of these two cited prior art references as suggested by the Examiner in the outstanding Office Action does not yield the present invention as claimed.

Furthermore, it is respectfully submitted that there is no disclosure or suggestion in either cited prior art reference or in the combined teachings of the cited prior art references to form a metal or metal alloy on an anti-nucleation layer except in a recess region, as recited in claim 1.

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Therefore, it is respectfully submitted that the combination of cited prior art references neither anticipates nor renders obvious the present invention as claimed, and that claims 1-3 are believed to be patentably distinct thereover.

Accordingly, favorable reconsideration and withdrawal of the rejection of claims 1-3 are respectfully requested.

C. Conclusion

Since none of the cited prior art references, alone or in combination, anticipates or renders obvious claims 1-3, it is respectfully submitted that these claims are in condition for allowance, and a notice to such effect is respectfully requested.


If the Examiner believes that additional discussions or information might advance the prosecution of the instant application, the Examiner is invited to contact the undersigned at the telephone number listed below to expedite resolution of any outstanding issues.

In view of the foregoing remarks, reconsideration of this application is respectfully requested, and an early and favorable further action upon all pending claims is hereby requested.

Respectfully submitted,

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PETITION and
DEPOSIT ACCOUNT CHARGE AUTHORIZATION

This document and any concurrently filed papers are believed to be timely. Should any extension of the term be required, applicant hereby petitions the Director for such extension and requests that any applicable petition fee be charged to Deposit Account No. 50-1645.

If fee payment is enclosed, this amount is believed to be correct. However, the Director is hereby authorized to charge any deficiency or credit any overpayment to Deposit Account No. 50-1645.

Any additional fee(s) necessary to effect the proper and timely filing of the accompanying-papers may also be charged to Deposit Account No. 50-1645.